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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/477,147	06/07/1995	PHILIP O. LIVINGSTON	43016-D/JPW/	5687

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EXAMINER

HOLLERAN, ANNE L

ART UNIT

PAPER NUMBER

1642

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Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Applicati n No.

08/477,147

Applicant(s)

LIVINGSTON ET AL.

Examiner

Anne Holleran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 31 March 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 123-146 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 123-146 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

### Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

1. The amendment 3/31/2003 is acknowledged. Claims 109-122 were canceled. Claims 123-146 were added.
2. Claims 123-146 are pending and examined on the merits.
3. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

***Claim Rejections Withdrawn:***

4. The provisional rejection of claims 109-122 (and new claims 123-146) under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of copending Application No. 08/196,154 is withdrawn upon further consideration. The claims of copending application No. 08/196,154 are drawn to conjugates comprising a GM2 ganglioside, whereas the claims of the instant application are drawn to conjugates comprising GD2, GD3 lactone, O-acetyl GD3 or GT3.
5. The rejection of claim 95 under 35 U.S.C. 103(a) as being unpatentable over Wiegand et al (U.S. Patent 5,599,914; issued Feb. 4, 1997; filed Nov. 24, 1989), in view of Fiume et al (Critical Rev. Therapeutic Drug Carrier Systems, 4(4): 265-284, 1988) Livingston et al. (Cancer Research, 149:7045-7050, 1989), Ritter et al. (Seminars in Cancer Biology, 2:401-409, 1991), Livingston et al. (U.S. Patent No. 5,102,663), Kensil et al. (The Journal of Immunology,

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146(2):431-437, 1991), Marciani et al. (Vaccine, 9:89-96, 1991) and Uemura et al (J Biochem, 79(6):1253-1261, 1976) as applied to claims 78, 80-92, 94 and 96-99 above and further in view of Irie (U.S. Patent 4,557,931) is withdrawn upon further consideration of the teachings of Irie with respect to the expression of GD2, GD3 lactone, O-acetyl GD3 or GT3 ganglioside expression in epithelial tissues.

***Objections / Rejections Maintained:***

6. Claims 123-146 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims of copending Application No. 08/475,784. The claims of copending application No. 08/475,784 are drawn to conjugates comprising a GD3 ganglioside, and the claims of the instant application are drawn to conjugates comprising GD2, GD3 lactone, O-acetyl GD3 or GT3. Although the conflicting claims are not identical, they are not patentably distinct from each other because they all claim conjugates and methods of using said conjugates, where the conjugate comprises a ganglioside conjugated to a protein through the ceramide portion. It appears that 08/475,784 is drawn to a genus of conjugates that comprise GD3 lactone or O-acetyl GD3, where the genus is small, and GD3 lactone or O-acetyl GD3 are obvious species of the genus GD3. Therefore, the provisional rejection is maintained.

Applicant argues that the provisional rejection should be allowed to drop and that the instant claims be allowed to issue, pursuant to MPEP section 804. Since the instant claims are not allowable, the provisional double patenting rejection is maintained for the reasons of record.

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7. Claims 123-146 are provisionally rejected under the judicially created doctrine of obviousness-type, double patenting as being unpatentable over the claims of copending Application No. 08/477,097 for reasons already made of record. Although the conflicting claims are not identical, they are not patentably distinct from each other because they all claim conjugates and methods of using said conjugates, where the conjugate comprises a ganglioside conjugated to a protein through the ceramide portion. Thus, the particular species drawn to GD2 claimed in the copending application would anticipate the instant genus composition claims.

Applicant argues that the provisional rejection should be allowed to drop and that the instant claims be allowed to issue, pursuant to MPEP section 804. Since the instant claims are not allowable, the provisional double patenting rejection is maintained for the reasons of record.

8. Claims 123-132 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wiegand et al (U.S. Patent 5,599,914; issued Feb. 4, 1997; filed Nov. 24, 1989) in view of Fiume et al (Critical Rev. Therapeutic Drug Carrier Systems, 4(4): 265-284, 1988), Ritter et al. (Seminars in Cancer Biology, 2:401-409, 1991), Kensil et al. (The Journal of Immunology, 146(2):431-437, 1991), and Marciani et al. (Vaccine, 9:89-96, 1991) and Uemura et al (J Biochem, 79(6):1253-1261, 1976).

Wiegand discloses modified glycosphingolipids (GM3, GD3, GM2 and GM1). Wiegand discloses a method for chemical modification of the sphingoid portions of glycosphingolipids to make glycosphingolipids capable of coupling to proteins (see abstract). Wiegand discloses that the method of chemical modification is that of ozonolysis at the C-4 double-bond of the sphingosine base resulting in the formation of a reactive aldehyde species (col. 2, line 43 - col. 3, line 67). Wiegand discloses that the aldehyde group is susceptible to reductive amination.

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Wiegand fails to disclose conjugation of the modified glycosphingolipid to KLH via an amine linkage between the C-4 carbon of sphingosine base and an  $\epsilon$ -aminolysyl group of KLH.

Wiegand also fails to disclose a composition that comprising a saponin derivable from the bark of the *Quillaja saponaria* Molina Tree (QS-21).

Fiume (1988) teaches that reductive amination of reactive aldehyde species with proteins having  $\epsilon$ -lysine groups is well known in the art (see page 268-269). Specifically, Fiume teaches that aldehyde group of a galactosyl residue may be reacted with an  $\epsilon$ -lysine of a protein.

Ritter (1991) teaches that IgG responses to gangliosides may be increased by the covalent attachment of foreign carrier proteins such as KLH to the gangliosides resulting in the T cell help necessary for the response (page 406, paragraph 1). Ritter teaches that the advantage of inducing an IgG antibody response (vs IgM) against gangliosides is that IgG: a) has a higher affinity, b) is better able to penetrate solid tissues, c) is able to mediate antibody-dependent cell-mediated cytotoxicity, d) and is generally detectable in the serum for longer periods after immunization.

Kensil et al teach that QS-21 (i.e. the instant carbohydrate derivable from the bark of a *Quillaja saponaria* Molina tree) produced a higher antibody response than conventional aluminum hydroxide (page 433, column 2, paragraph 4, and Figure 3). Kensil et al also teach that the immune responses obtained with QS-21, reached a plateau at doses between 10-80 ug in mice (page 433, column 1, paragraph 3).

Maricani et al teach the use of QS-21 adjuvant was useful because it did not cause a toxic reaction in cats (page 93, paragraph 1).

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Uemura et al (J Biochem, 79(6):1253-1261, 1976) teach that the ozonolysis and reduction of various sphingolipids did not affect the haptenic reactivity of the ganglioside derivative with antibodies.

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to have used the modified glycosphingolipids of Wiegand to make glycoconjugates that are the same as those claimed. Weigand teaches a modified glycosphingolipid that has a reactive aldehyde group (at the C-4 position of the sphingosine base) that may be used for coupling to proteins as taught by Fiume, because Fiume demonstrates that methods of reductive amination to link proteins, via  $\epsilon$ -lysine residues, to reactive aldehyde groups is known in the art. Because Wiegand teaches a method of ozonolysis that results in the formation of a reactive aldehyde species, the bond that would be formed between the C-4 carbon of the sphingosine base and the KLH would be an amino linkage that would cause the C-4 carbon to be present in a  $\text{CH}_2$  group. It would have been further prima facie obvious to one of ordinary skill in the art to have used KLH as the protein carrier because, as Ritter teaches, attachment of gangliosides to carrier proteins such as KLH increase IgG responses to gangliosides. It would have been prima facie obvious to one of ordinary skill in the art to add QS-21, because, as taught by Kensil, it provides for a higher antibody response, and QS-21 provides the advantages that it is not toxic to animals (see Marciani).

It also would have been prima facie obvious to optimize the doses of QS-21 in the composition, also it would have been prima facie obvious to one of ordinary skill in the art to optimize the weight ratio of the components of the composition to provide an optimal response.

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One would have reasonably expected the conjugation procedure to work as substituted because conjugation through the e-aminolysyl groups of carrier proteins for enhance immunogenicity is routine in the art and, as Uemura (1976) teaches, ozonolysis and reduction of various sphingolipids does not affect the haptenic reactivity with antibodies.

9. Claims 123, 132-135 and 137-146 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wiegand et al (U.S. Patent 5,599,914; issued Feb. 4, 1997; filed Nov. 24, 1989), Fiume et al (Critical Rev. Therapeutic Drug Carrier Systems, 4(4): 265-284, 1988) Livingston et al. (Cancer Research, 149:7045-7050, 1989) in view of Ritter et al. (Seminars in Cancer Biology, 2:401-409, 1991), Livingston et al. (U.S. Patent No. 5,102,663), Kensil et al. (The Journal of Immunology, 146(2):431-437, 1991), and Marciani et al. (Vaccine, 9:89-96, 1991) and Uemura et al (J Biochem, 79(6):1253-1261, 1976).

As discussed above, Wiegand in combination with Fiume teaches a glycoconjugate as claimed in claims 123 and 132 .

Livingston teaches that melanoma recurrence was delayed in patients developing GM2 antibodies after treatment with the composition (page 7048, paragraph 1 and column 2, paragraph 2). Livingston et al teach that more patients produced IgM antibodies than IgG antibodies to the GM2 (page 7047, paragraph bridging columns 1-2). Livingston et al also teach the gangliosides GM2, GD2 and GD3 are expressed on the cell surface of human malignant melanomas (page 7045, column 1, paragraph 2).

Ritter (1991) teaches that IgG responses to gangliosides may be increased by the covalent attachment of foreign carrier proteins such as KLH to the gangliosides resulting in the T cell help



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necessary for the response (page 406, paragraph 1). Ritter teaches discloses that the advantage of inducing an IgG antibody response (vs IgM) against gangliosides is that IgG: a) has a higher affinity, b) is better able to penetrate solid tissues, c) is able to mediate antibody-dependent cell-mediated cytotoxicity, d) and is generally detectable in the serum for longer periods after immunization.

Livingston et al (U.S. Patent No. 5, 102,663) teach that gangliosides GM3, GM2, GD3, GD2, GT3 and O-acetyl GD3 are gangliosides that are prominent cell-membrane components of melanoma and other tumors of neuroectodermal origin (column 1, lines 22-28).

Kensil et al teach that QS-21 (i.e. the instant carbohydrate derivable from the bark of a Quillaja saponaria Molina tree) produced a higher antibody response than conventional aluminum hydroxide (page 433, column 2, paragraph 4, and Figure 3). Kensil et al also teach that the immune responses obtained with QS-21, reached a plateau at doses between 10-80 ug in mice (page 433, column 1, paragraph 3).

Maricani et al teach the use of QS-21 adjuvant was useful because it did not cause a toxic reaction in cats (page 93, paragraph 1).

Uemura et al (J Biochem, 79(6):1253-1261, 1976) teach that the ozonolysis and reduction of various sphingolipids did not affect the haptenic reactivity of the ganglioside derivative with antibodies.

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to have used the modified glycosphingolipids of Wiegand to make glycoconjugates that are the same as those claimed, and then to have used the glycoconjugates in compositions for the stimulating or enhancing antibody production or in a method of treating

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cancer, because Livingston teaches that melanoma recurrence is delayed in patients developing GM2 antibodies after treatment with vaccines comprising GM2 (page 7048, paragraph 1 and column 2, paragraph 2). Livingston et al teach that more patients produced IgM antibodies than IgG antibodies to the GM2 (page 7047, paragraph bridging columns 1-2). Livingston et al also teach the gangliosides GM2, GD2 and GD3 are expressed on the cell surface of human malignant melanomas (page 7045, column 1, paragraph 2). It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to have added QS-21 as an adjuvant to the GM-2-KLH conjugate for use as a vaccine because the conjugated composition would be expected to enhance the IgG response to the ganglioside, as taught by Ritter et al (1991), thus providing the advantages by Ritter et al (1991) and, as Kensil teaches, adding the QS-21 is advantageous because it provides for a higher antibody response than the commonly used adjuvant. Also, QS-21 provides the advantages that it is not toxic to animals (see Marciani).

It also would have been prima facie obvious to optimize the doses of QS-21 in the composition, also it would have been prima facie obvious to one of ordinary skill in the art to optimize the weight ratio of the components of the composition to provide an optimal response.

One would have reasonably expected the conjugation procedure to work as substituted because conjugation through the e-aminolysyl groups of carrier proteins for enhance immunogenicity is routine in the art and, as Uemura (1976) teaches, ozonolysis and reduction of various sphingolipids does not affect the haptenic reactivity with antibodies.

It also would have been prima facie obvious to one of ordinary skill in the art to substitute any one of GD2, GD3 lactone, or O-acetyl GD3 for the GM2 ganglioside in the

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composition and method as combined supra because they are all prominent cell-membrane components of melanomas as taught by Livingston et al (U.S. Patent No. 5,102,663).

Optimization of the dosage, route of immunization, number of sites of immunization to administer the composition is will within the skill of the ordinary artisan.

One would have reasonably expected the conjugation procedure to work as substituted because conjugation through the e-aminolysyl groups of carrier proteins for enhance immunogenicity is routine in the art and Uemura et al (J Biochem, 79(6):1253-1261, 1976) teach that the ozonolysis and reduction of various sphingolipids did not affect the haptenic reactivity with antibodies.

10. Claims 135 and 136 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wiegand et al (U.S. Patent 5,599,914; issued Feb. 4, 1997; filed Nov. 24, 1989), in view of Fiume et al (Critical Rev. Therapeutic Drug Carrier Systems, 4(4): 265-284, 1988) Livingston et al. (Cancer Research, 149:7045-7050, 1989), Ritter I (Seminars in Cancer Biology, 2:401-409, 1991), Livingston et al. (U.S. Patent No. 5,102,663), Kensil et al.(The Journal of Immunology, 146(2):431-437, 1991), Marciani et al. (Vaccine, 9:89-96, 1991) and Uemura et al (J Biochem, 79(6):1253-1261, 1976) as applied to claims 78, 80-92, 94 and 96-99 above and further in view of Diatlovitskaia et al. (Biokhimiia, 56(3): 560-564, 1991, Mar.; Abstract only) and Ritter II (Ritter et al, Immunobiology, 182(1): 32-43, 1990; Abstract only).

The teachings of Wiegand , Fiume, Livingston et al.(1989), Ritter I (1991), Livingston et al. (U.S. Patent No. 5,102,663), Kensil (1991), Marciani (1991) and Uemura (1976) are

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discussed above. The combination differs by not teaching the administration of the composition for treating cancer of epithelial origin.

Diatlovitskaia teaches that the ganglioside GD3 is expressed breast carcinomas, which is an example of a cancer of epithelial origin.

Ritter II teaches that GD3 derivatives such as GD3 lactone are more immunogenic than GD3.

It would have been prima facie obvious to one of ordinary skill in the art at the time the invention was made to administer the GM-2-KLH conjugate/ QS-21 composition or other ganglioside conjugate/QS-21 composition as combined supra to patients afflicted with or susceptible to a recurrence of cancer of an epithelial origin (i.e. breast carcinomas) because the ganglioside GD3 is expressed in an epithelial cancer such as breast cancer, and one of ordinary skill in the art would expect, in view of the teachings of Ritter II, that the antibodies produced by administration of a conjugate comprising GD3 lactone would be specific for epithelial tumors that express GD3.

***Response to Applicant's Arguments:***

11. Applicant argues that the claimed inventions are not obvious over the prior art, because Weigand teaches how to make glycoconjugates generally and does not disclose any species of glycoconjugate that is any better than any other. This argument is not persuasive, because the standard for obviousness is that the prior art as whole is compared to the claimed inventions. Thus, arguing a deficiency in Weigand is insufficient to overcome the present grounds of rejection. Furthermore, Weigand does disclose specific species of glycoconjugates, (GM3, GD3,

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GM2 and GM1), which may be made by the disclosed method. Additionally, the prior art as whole teaches specific glycosides that are useful as tumor antigens and provides motivation to make specific species.

***New Grounds of Rejection:***

12. Claims 126-128 and 146 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. The basis for this rejection is that the addition of these claims introduces new matter into the specification as originally filed.

Claims 126-128 recite ranges that are not described in the specification. Claim 146 is drawn to a method for delaying recurrence of melanoma. There does not appear to be support in the specification for methods for delaying recurrence of melanoma. The passages pointed to by applicant as providing support do not teach the recited references and do not teach methods for delaying the recurrence of melanoma.

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***Conclusion***

No claim is allowed.

Any inquiry concerning this communication or earlier communications from the Office should be directed to Anne Holleran, Ph.D. whose telephone number is (703) 308-8892. Examiner Holleran can normally be reached Monday through Friday, 9:30 am to 2:30 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Anthony Caputa, Ph.D. can be reached at (703) 308-3995.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group receptionist at telephone number (703) 308-0196.

Anne L. Holleran  
Patent Examiner  
June 4, 2003



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